REMARKS

Reconsideration of the present application is respectfully requested. Claims 1-34 were originally presented. Claims 21-34 have been withdrawn as being drawn to a non-elected invention. Claims 1-20 are presently pending, with claim 1 being in independent form.

The Examiner is respectfully requested to reconsider and withdraw the rejection of claims 1-12 and 19 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,146,519 (Koves) in view of U.S. Patent No. 5,914,292 (Khare) and U.S. Patent No. 5,482,617 (Collins) with U.S. Patent No. 4,827,069 (Kushnerick) incorporated by reference in Collins.

Koves discloses a reactor 10 with a standpipe 16 in which catalyst enters into the reactor. A fluidizing medium enters the reactor via conduit 17. Additional fluidizing medium can enter the reactor through conduit 19. Particles in the fluidizing medium pass upwardly throughout the riser and the effluent from the riser is subsequently discharged from the top of the riser via disengaging arm 22 into disengaging space 24. Hydrocarbon and catalyst are then separated within separators 26 and the separated hydrocarbon vapor stream exits the reactor via outlet nozzle 28. Meanwhile, the catalyst then passes into stripping zone 32 where it is contacted with stripping gas and passes through a series of baffles and finally leaves the reactor via conduit 36. (See Koves, Col. 4 lines, 46 – 67 and Col. 5, lines 1 – 37 and Figure).

Khare discloses a transport desulfurization process system 10. A fluid stream is charged to riser 12 via conduit 14. The riser contains a fluidization zone and the fluid stream is introduced in the riser traveling in a first linear direction 16. A stream with a concentration of sulfur lower than that of the fluid stream is separated from particulate 18 and passes out of riser 12 via conduit 20. The separated particulate then passes to recirculation conduit 22. This is a transfer zone wherein the separated particulate circulates in second linear direction 24. A major portion of this is then returned to riser 12. (See Khare, Col. 13, lines 31 – 53 and Figure 5.)

The Examiner states "...Khare discloses circulating a sorbent material with a stream containing sulfur and to remove sulfur from the fluid stream and that the disengagement zone is broader than the reaction zone. (See Khare, Col. 3, lines 11 – 16, Col. 10, lines 28 – 48 and Figure 2)." (See Final Office Action, page 3, paragragh 5). Applicants respectfully point out that Figures 2, 3 and 4 in the Khare reference depict a bench scale test apparatus to measure the attrition resistance of the fluidizable and circulatable sorbent material. (See Khare, Col. 9, lines

65 – 67 to Col. 10, lines 1 to 47). The desulfurization process in Khare takes place in a riser as depicted in Figure 5, as described above.

Collins discloses a desulfurization process in which organic sulfur compounds in hydrocarbon streams are converted to hydrogen sulfide and subsequently removed. (See Collins, Abstract and column 1, lines 9 – 13.) The process in the Collins reference operates in a dense fluid bed reactor and regenerator system. (See Collins, column 6, lines 53 – 55.)

Kushnerick discloses a process for the conversion of a light olefinic gas feed stock to produce C5+ hydrocarbons and also a conversion of reformate feed stock to produce C7 to C11 aromatic hydrocarbons. (See Kushnerick, Abstract.) Olefin and reformate feed enter reactor vessel 20 via line 13 wherein the feed contacts above the catalyst particles. The reactor can contain baffles in order to control radial and axial mixing. Catalyst is withdrawn via outlet 28 and passes to vessel 30 for regeneration. The regenerated catalyst passes to reactor 20 via conduit 46. Catalyst is lifted to the catalyst bed through riser conduit 50. Separators 52 and 54 separate catalyst particles from the feed stock. The hydrocarbon feed stock product which is separated from the catalyst particles exits the reactor via conduit 56. (See Kushnerick column 7, lines 55 – 68 and column 8, lines 1 – 53 and figure.)

The Examiner states "... it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Koves to include a desulfurization method using a dense fluid bed reactor, having an average particle density of 19 – 31 lb/ft^3, because such a reactor is preferred to maintain catalyst activity." (See Final Office Action, page 4, paragraph 4.)

To establish a *prima facie* case of obviousness, the Examiner must prove three basic criteria: (1) "there must be some suggestion or motivation, either in references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine their teachings;" (2) "there must be a reasonable expectation of success;" (3) "the prior art reference or combination of references must teach or suggest all the claim limitations." MPEP § 706.02 (J). The teachings or suggestions to combine or modify references and a reasonable expectation of success must be found in the prior art, not based on the applicants prior disclosures. *In re Veack,* 947 F.2d 448, 20 USP Q2D 1438 (Fed. Circ. 1991).

Applicants submit that the references cited do not teach or suggest all the claim limitations. As previously discussed, Koves and Khare both disclose the use of transport riser

reactors to carry out their respective processes. In transport riser reactors, solid particles (1) become entrained and the upwardly moving gas, (2) flow through the riser with the moving gas, and (3) exit the riser with the moving gas. The Collins reference discloses a desulfurization process utilizing a zeolite catalyst. This process uses a transport bed reaction zone as described in Kushnerick. Claim 1 of the instant application claims a fluizidized bed reactor with a reaction zone and a disengagement zone. The disengagement zone is broader than the reaction zone. (See application, claim 1). The reactor in the Kushnerick reference discloses separators positioned in the upper part of the reactor vessel (See Kushnerick, col. 8, lines 46 – 48.) Claim 1 of the instant application requires the upper disengagement zone of the reactor being broader than the lower reaction zone. The Kushnerick disclosure makes no reference or suggestion as to the differences of diameters, if any, in the reactor's upper and lower zones. According to the MPEP, "[w]hen the reference does not disclose that the drawings are to scale and is silent as to the dimensions, arguments based on the measurements of the drawings features are of little value." MPEP § 2125 See *Hockerson-Halberstadt Inc. v. Avia Group Int'l.*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000). (The disclosure gives no indication that the drawings were drawn to scale. "[I]t is well established that patent drawings do not define precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue."). Therefore, the Examiner cannot rely on the drawings of Kushnerick to establish the claim 1 limitations of the disengagement zone being broader than the reaction zone in the instant case.

Additionally, the Examiner has failed to establish a suggestion or motivation to incorporate a reactor type such as the one in Kushnerick into the Koves and Khare references. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon,* 733 F.2d 900,221 USPQ 1125 (Fed. Cir. 1984). Koves and Khare both teach that their transport reactors operate in the dilute phase regime. Several defining characteristics of a dilute phase regime include low particle densities, high gas velocities, and short residence times. In particular, Koves discloses that the "density in the dilute phase regime will be less than about 20 lbs/ft^3." (Column 6, lines 4 – 5), while Khare discloses that the "average riser bed density was 6 lbs/cu ft." (Column 15, line 47). Thus, a reactor vessel having an average fluidized bed density of about 300 to 500 kilograms per cubic meter or around 19 to

31 lbs. per cubic foot, as disclosed in Kushernick would be outside the boundaries of the preferred method of operation in both the Koves and Khare references. Thus, if a fluidized bed with the preferred particle density of Kushernick were incorporated into Koves or Khare, the Koves and Khare reactors would not be operating under optimal conditions and therefore, incorporating the Kushernick particle densities would render both the Koves and Khare reactors unsatisfactory for their intended purposes. Therefore, the Examiner has not shown a suggestion or motivation to modify the Koves and Khare references with the particle densities of Kushnerick.

The Examiner is respectfully requested to reconsider and withdraw the rejections of claims 13 – 15 and 20 under 35 USC 103(a) as being unpatentable over Koves in view of Khare and further in view of Khare 2 (US 6,184,176).

Koves discloses a reactor, as described above.

Khare discloses a transport desulfurization process system, as described above.

Khare 2 discloses sorbent compositions for the desulfurization of cracked gasoline or diesel fuels (See Khare 2 Abstract). The compositions comprise zinc oxide, silica, alumina and a substantially reduced valence cobalt (See Khare 2, Abstract). During the preparation of the sorbent composition, composition is subject to reduction with a suitable reducing agent, so as to produce a composition having a substantial zero valance cobalt content. (See Khare 2, Col. 5, lines 62 – 67).

The Examiner states "Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Koves in view of Khare to include subjecting a promoter metal to a reduction step where the metal is contacted with hydrogen in order to reduce the valence of the promoter metal to permit the removal of sulfur from cracked gasoline or diesel fuel." (See Final Office Action, page 6, fifth paragraph to page 7 first paragraph).

As stated above, Applicants assert that the Examiner has failed to meet the burden of establishing a *prima facie* case of obviousness. The Examiner has failed to establish a suggestion or motivation to modify or combine the referenced teachings. Koves and Khare both teach that their transport reactors operate in the dilute phase regime. As stated above, neither reference discloses a reactor system that operates either in the manner of the reactor system in the Kushnerick reference or like the reactor in the instant claims.

The Examiner is respectfully requested to reconsider and withdraw the rejection of claims 16 – 18 under 35 USC 103 (a) as being unpatentable over Koves in view of Khare as applied to claim 1 above, and further in view of Walker (U.S. 2,931,711).

Koves discloses a reactor, as described above.

Khare discloses a transport desulfurization process system, as described above.

Walker discloses "a novel reactor design adapted to handle fluidized systems…whereby improved gas solids contact in such systems can be affected." (Walker, Col. 1, lines 15 – 18). The fluidized bed system in the Walker reactor provides for a medium for synthesizing "hydrocarbons from carbon monoxide and hydrogen in the presence of a fluidized catalyst." (Walker, Col.1, lines 1 – 9). Walker additionally provides for a configuration of two trays within the reactor in order to provide "improved gas solid contacting." (Walker, Col. 1, lines 57 – 60).

The Examiner states "therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Koves in view of Khare to include a reactor having stacked trays that each have parallel tubes in that the trays can be arranged so that the tubes of other trays are not parallel with other tubes in different trays and form angles between greater than 0 up to about 90° in order to aid an reactor fluidization." (See Final Office Action, page 7, paragraph 6 to page 8, first paragraph).

As stated above, Applicants argue that the Examiner has failed to meet the *prima facie* standards for obviousness under 35 USC 103 (a). Both the Koves and Khare references clearly disclose different reactor systems than the one in the instant claims. Additionally, the Walker discloser is silent regarding the matter of the precise measurements of the drawings or the drawings being drawn to scale. Therefore, the reliance on the non-scaled drawings in Walker is improper in attempting to establish angular measurements.

In view of the foregoing, Applicants respectfully request that a timely Notice of Allowance be issued in this case. Should the Examiner have any questions, please contact the undersigned at (918) 661-0652.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 16-1575.

Respectfully submitted,
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